

# SURFACE TEXTURE

## SURFACE CHARACTERISTIC DESIGNATIONS

DP 1110-1-1  
APPA  
-1 MAR 87

### SURFACE SYMBOL:

THE SURFACE ROUGHNESS SYMBOL REPRESENTS THE MAXIMUM ACCEPTABLE ROUGHNESS, OR TWO NUMBERS REPRESENT THE MAXIMUM AND MINIMUM ACCEPTABLE ROUGHNESS. THE SIZE OF THE SURFACE ROUGHNESS SYMBOL SHOULD BE APPROXIMATELY ONE HALF THE SIZE AS SHOWN IN FIGURE 1 FOR LARGE DRAWINGS AND PROPORTIONATELY SMALLER FOR SMALL SCALE DRAWINGS. THE DESIGNER WILL FURNISH THE DRAFTSMAN THE APPROPRIATE SYMBOL FOR EACH TYPE OF FINISH REQUIRED.

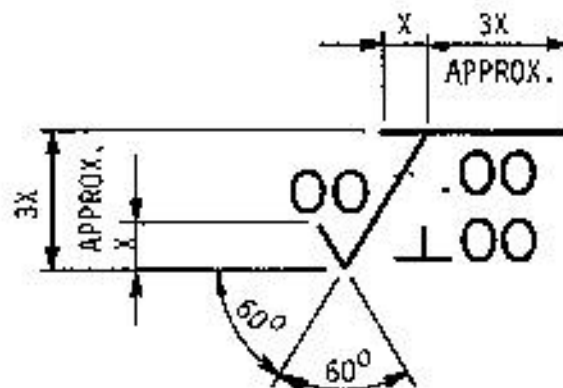


FIGURE 1. - PROPORTIONS FOR BASIC SYMBOL

### SURFACE ROUGHNESS RATING:

THE ROOT MEAN SQUARE (RMS) NUMBER VALUE EXPRESSED IN MICROINCHES (0.000001 INCH) REPRESENTS THE ROUGHNESS OF A SURFACE. APPROVED VALUES OF SURFACE ROUGHNESS NUMBERS ARE AS FOLLOWS:

1/4, 1/2, 1, 2, 4, 8, 16, 32, 63, 125, 250, 500, 1000, 2000

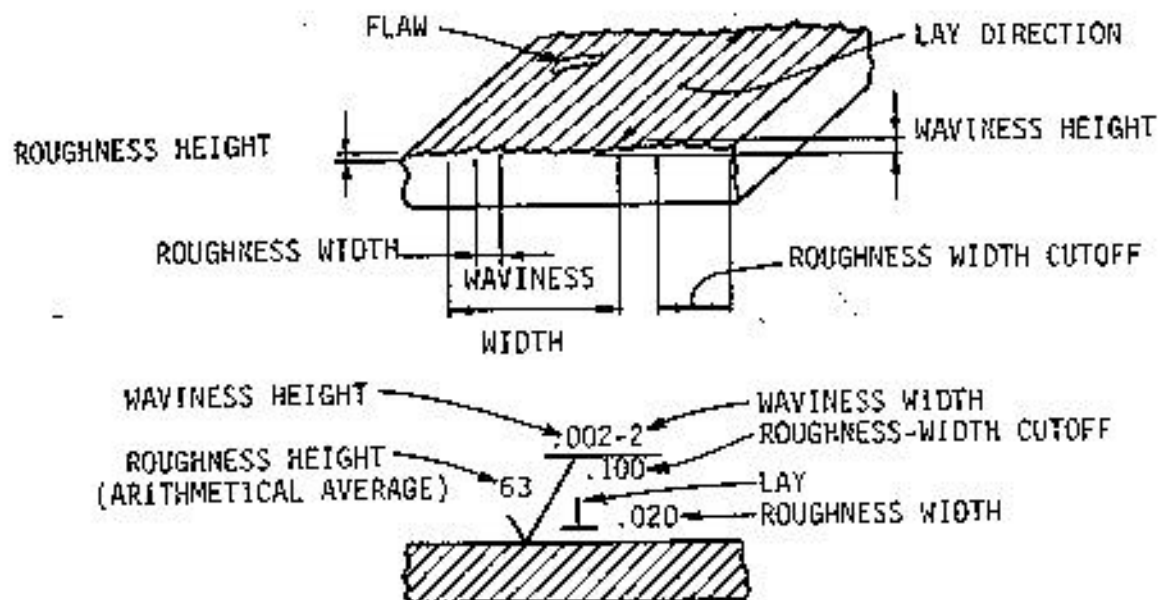
OTHER VALUES MAY BE SPECIFIED IF NECESSARY TO MEET UNUSUAL PRECISION REQUIREMENTS. SETS OF COMPARATOR BLOCKS USED FOR INSPECTION PURPOSES ORDINARILY INCLUDE SPECIMENS OF THE FOLLOWING VALUES:

2, 4, 8, 16, 32, 63, 125, 250, 500

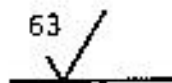
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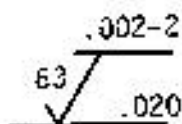
## RELATION OF SYMBOLS TO SURFACE CHARACTERISTICS:



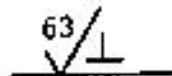
## BASIC AND COMBINED SYMBOLS:



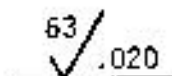
SURFACE ROUGHNESS SYMBOL (BASIC): SURFACE ROUGHNESS NUMBER PLACED ADJACENT TO AND INSIDE OF LONG LEG.



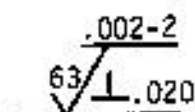
SURFACE ROUGHNESS AND WAVINESS: WAVINESS HEIGHT VALUE, AND PERCENTAGE OF CONTACT AREA IF SPECIFIED, PLACED ABOVE HORIZONTAL LINE CAPPING SURFACE ROUGHNESS SYMBOL.



SURFACE ROUGHNESS AND LAY: PLACE APPROPRIATE LAY DESIGNATION SYMBOL AT RIGHT OF LONG LEG OF SURFACE ROUGHNESS SYMBOL.



SURFACE ROUGHNESS AND SURFACE ROUGHNESS WIDTH: SURFACE ROUGHNESS WIDTH, WHEN AND IF REQUIRED, PLACED AT THE RIGHT OF THE SYMBOL. (NOTE: SPECIFICATION OF SURFACE ROUGHNESS WIDTH IS RARELY NECESSARY OR ADVISABLE.)



SURFACE ROUGHNESS, WAVINESS, LAY, AND SURFACE ROUGHNESS WIDTH: WAVINESS, LAY, AND SURFACE ROUGHNESS WIDTH DESIGNATIONS IN SAME GENERAL LOCATIONS AS SHOWN ABOVE.

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### APPLICATION OF SYMBOLS AND RATINGS:

SURFACE ROUGHNESS SHALL BE SPECIFIED ON DRAWINGS BY MEANS OF THE SURFACE SYMBOL. (SEE FIGURE 2). WHEREVER PRACTICABLE THE APEX OF THE SURFACE SYMBOL SHALL BE DRAWN TOUCHING THE SPECIFIED SURFACE. WHERE SPACE IS LIMITED THE SURFACE TO WHICH THE SURFACE SYMBOL APPLIES MAY BE INDICATED BY PLACING THE APEX OF THE SYMBOL ON AN EXTENSION LINE OR ON A LEADER WITH AN ARROW HEAD TOUCHING THE SURFACE. THESE VARIOUS METHODS ARE ILLUSTRATED IN FIGURE 2. THE SURFACE ROUGHNESS INDICATION FOR ANY INDIVIDUAL SURFACE SHALL BE SHOWN IN ONE PLACE ONLY AND SHALL NOT BE DUPLICATED IN VARIOUS VIEWS OR SECTIONS.

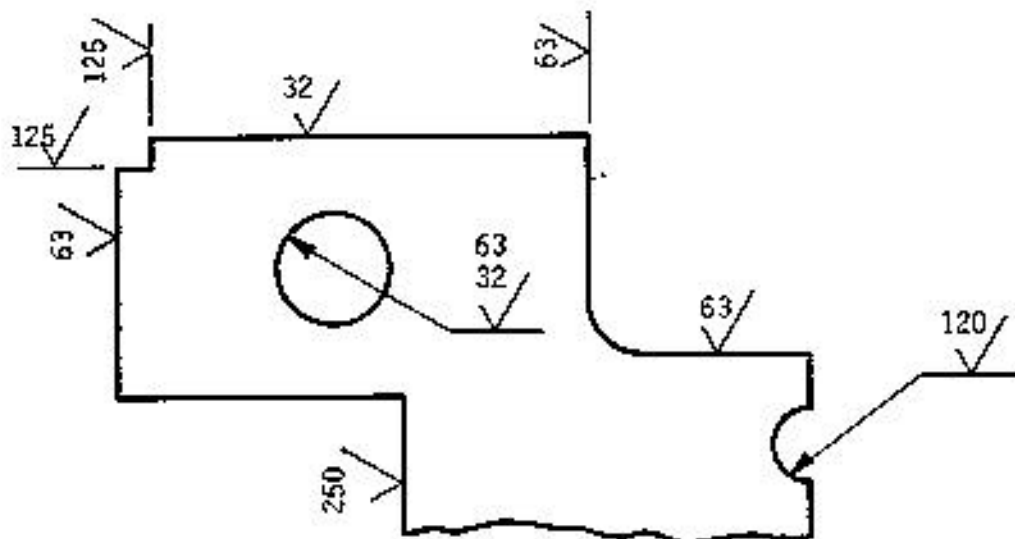


FIGURE 2 - SURFACE SYMBOL PLACEMENT

IN THE CASE OF A PIECE WHICH IS FINISHED ALL OVER TO AN APPROXIMATELY UNIFORM DEGREE OF SURFACE ROUGHNESS, THE DRAWING BLOCK NOTE SHOULD INCLUDE THE DIRECTION, "FINISH ALL OVER  $\checkmark$ ". NO OTHER FINISH MARKS OR SYMBOLS INDICATING SURFACE ROUGHNESS WILL APPEAR ON THE DRAWING OF THE PIECE.

IN THE CASE OF A PIECE WHICH IS FINISHED ALL OVER, BUT TO DIFFERENT DEGREES OF SURFACE ROUGHNESS, THE DRAWING BLOCK NOTE SHOULD INCLUDE THE DIRECTION, " $\checkmark$  ALL OVER EXCEPT AS NOTED". THE NUMBER ENCLOSED IN THE SYMBOL REPRESENTS THE MAXIMUM ALLOWED SURFACE ROUGHNESS FOR THE GREATEST NUMBER OF THE SURFACES OF THE PIECE SURFACES TO WHICH THE PREDOMINANT SURFACE ROUGHNESS NUMBER DOES NOT APPLY SHOULD BEAR INDIVIDUAL ROUGHNESS SYMBOLS ENCLOSING THE APPROPRIATE ROUGHNESS NUMBER IN EACH CASE. IF NO SINGLE

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### APPLICATION OF SYMBOLS AND RATINGS: (CONTINUED)

DEGREE OF SURFACE ROUGHNESS PREDOMINATES, ALL SURFACES SHOULD BEAR INDIVIDUAL SURFACE SYMBOLS ENCLOSING THE APPROPRIATE ROUGHNESS NUMBER IN EACH CASE, AND THE NOTE "  $\sqrt{xx}$  ALL OVER EXCEPT AS NOTED" SHOULD BE OMITTED.

IN THE CASE OF A CASTING, FORGING, PIECE MADE FROM BAR STOCK, ETC., IN WHICH ALL FINISHED SURFACES REQUIRE THE SAME DEGREE OF SURFACE ROUGHNESS, THE DRAWING BLOCK NOTE SHOULD INCLUDE THE DIRECTION "SURFACES MARKED  $\sqrt{\phantom{xx}}$  TO HAVE  $\sqrt{xx}$ ". IN SUCH CASES THE SURFACE SYMBOLS APPEARING ON THE SURFACES TO BE FINISHED WILL BE LEFT BLANK. THE SURFACE ROUGHNESS NUMBER OR NUMBERS APPEAR ONLY IN THE BLOCK NOTE.

IN THE DRAWING OF A CASTING, FORGING, PIECE MADE FROM BAR STOCK, ETC., OF WHICH THE FINISHED SURFACES REQUIRE DIFFERENT DEGREES OF SURFACE ROUGHNESS, EACH FINISHED SURFACE SHALL BEAR THE SURFACE SYMBOL ENCLOSING THE SURFACE ROUGHNESS NUMBER OR NUMBERS CORRESPONDING TO THE ALLOWED ROUGHNESS.

PLATED SURFACES SHALL HAVE THE SURFACE ROUGHNESS SPECIFIED BY THE SURFACE SYMBOL AND SURFACE ROUGHNESS NUMBER AND A NOTE INDICATING WHETHER THE ROUGHNESS IS APPLICABLE TO THE SURFACE BEFORE PLATING, AFTER PLATING, OR BOTH BEFORE AND AFTER PLATING.

SURFACES OF WHICH THE REQUIRED CHARACTERISTICS CAN ONLY BE OBTAINED BY BUFFING, LAPPING, SCRAPING, HONING, ETC., SHALL HAVE THE SURFACE ROUGHNESS SPECIFIED BY THE SURFACE ROUGHNESS SYMBOL AND NUMBER, FOLLOWED OR PRECEDED BY A NOTATION OF THE REQUIRED OPERATION, e.g.,  $\sqrt[4]{\phantom{xx}}$  LAP.

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### APPLICATION OF SYMBOLS AND RATINGS: (CONTINUED)

#### EXCEPTIONS:

SURFACE ROUGHNESS SHALL NOT BE SPECIFIED FOR THE FOLLOWING IF THE SURFACE PRODUCED BY FIRST CLASS WORKMANSHIP IS CONSIDERED SATISFACTORY FOR THE PURPOSE INTENDED:

-60° SCREW THREADS	TOOL RUNOUT (THREAD RELIEF)
PIPE THREADS	SCREW DRIVER SLOTS
TAPPED HOLES	BOLT AND SCREW HEADS
DRILLED HOLES	CAST SURFACES
REAMED HOLES	FORGED SURFACES
SPLINES IN HOLES	ROLLED SURFACES
SPLINES ON SHAFTS	EXTRUDED SURFACES
BROACHED HOLES	COMMERCIAL FINISHED MATERIAL
MACHINE SCREW HOLES	SPOT FACED SURFACES
COUNTERBORED HOLES	FLAME CUT SURFACES
COUNTERSUNK HOLES	SAWED SURFACES
ENDS OF BOLTS, STUDS AND DOWELS	SHEARED SURFACES
KEYWAYS OF MINOR IMPORTANCE	SAND, SHOT OR HYDROBLASTED SURFACES

WHEN THE SURFACES NOTED ABOVE ARE CRITICAL DUE TO DESIGN REQUIREMENTS, AS FOR EXAMPLE, SPLINED PARTS IN SLIDING CONTACTS, AN APPROPRIATE ROUGHNESS NUMBER SHOULD BE SPECIFIED REGARDLESS OF WHETHER THE NUMBER SO SPECIFIED IS THE SAME AS THE ROUGHNESS NUMBER SPECIFIED IN BLOCK NOTE OF THE PIECE.